8. $\therefore [\frac{p}{v}(v+m)+n]\div(v-n)=\frac{p(v+m)+nv}{v(v-n)}=20\frac{8}{9}\%$.

Also solved by *M. E. GRABER.*

ALGEBRA.

125. Proposed by LESLIE L. LOCKE, Instructor in Mathematics, Michigan Agricultural College, Ingram County, Mich.

What special expedient will solve the system

$$\left.\begin{array}{l} x^4-y^4=369\ldots.(1) \\ x-y=1 \quad\ldots(2) \end{array}\right\}?$$

Solution by O. S. WESTCOTT, Chicago, Ill.; J. SCHEFFER, A. M., Hagerstown, Md.; J. K. ELWOOD, A. M., Pittsburg, Pa.; J. M. BOORMAN, Woodmere, N. Y.; and the PROPOSER.

From (2), $y=x-1$. Substituting this value of y in (1), $x^4-(x-1)^4=369$ or $0.x^4+4x^3-6x^2+4x=370$. Since the coefficient of x^4 is 0, therefore, if we regard the equation as of the fourth degree, one root is ∞. Hence if $x=\infty$, $y=\infty$. The remaining three values of x are found from the equation $2x^3-3x^2+2x-185=0$. This may be solved by the method of Tartaglia; or, by trial if 5 is substituted for x, the first member vanishes. Hence, $x=5$. Dividing $2x^3-3x^2+2x-185=0$, by $x-5$, we have $2x^2+7x+37=0$. $\therefore x=\frac{1}{4}[7\pm\sqrt{(-247)}]$.

$\therefore$ The values of x are ∞, 5, and $\frac{1}{4}[7\pm\sqrt{(-247)}]$, and the values of y are ∞, 4, and $\frac{1}{4}[3\pm\sqrt{(-247)}$.

REMARK. The Proposer says his object in proposing this problem was, 1. To learn if there is a general method of solving such problems when factors can not be readily found, and, 2. To call attention to a fact that is not mentioned in many elementary text-books on Algebra, viz., the loss of a root by dividing one equation by another, or by subtracting one from another if thereby the degree of the equation is diminished.

The above contributors used some modifications in deriving the various steps in the solution ofth is problem, but these modifications were not considered of sufficient importance to warrant separate entries. Solutions were also received from P. S. Berg, G. B. M. Zerr, and H. C. Whitaker. ED. F.

126. Proposed by CHARLES C. CROSS, Meredithville, Va.

A and B run a race; B, who runs slower than A by a miles in b hours, starts first by c minutes, and they get to the n-mile stone together. Required their rates of running. If $a=1$, $b=2$, $c=2$, and $n=4$, what is the result?

Solution by GRANTLAND MURRAY, Adjunt Professor of Mathematics, Emory College, Oxford, Ga.; J. SCHEFFER, A. M., Hagerstown, Md.; H. C. WHITAKER, A. M., Ph. D., Professor of Mathematics, Manual Training School, Philadelphia, Pa.; C. E. ARMENTROUT, A. B., Professor of Latin and Mathematics, Rockingham Military Institute, Mt. Crawford, Va.; P. S. BERG, Principal of Schools, Larimore, N. D.; M. A. GRUBER, A. M., War Department, Washington, D. C.; C. ARTHUR LINDEMANN, A. M., Professor of Mathematics and Science, Virginia Union University, Richmond, Va.; and D. B. NORTHRUP, Mandana, N. Y.

Let x=number of miles A runs per hour, then $x-a/b$=number of miles B runs per hour.

n/x=number of hours A requires to run n miles, $n/(x-a/b)$=number of B requires to run n miles.

$\therefore \frac{n}{x-a/b}-\frac{n}{x}=\frac{c}{60}$, or $bcx^2-acx-60an=0$; whence

$$x=\frac{ac\pm\sqrt{(a^2c^2+240abcn)}}{2bc}.$$

Substituting the proposed values for a, b, c, and n gives, $x=8$, and $x-a/b=7\frac{1}{2}$.

Also solved by *G. B. M. ZERR.*

GEOMETRY.

153. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.

If P, P', Q, Q' be the extremities of two chords of a conic section, and both chords pass through the point A, show that the sum of the squares of the reciprocals of AP, AP', AQ, AQ' is constant.

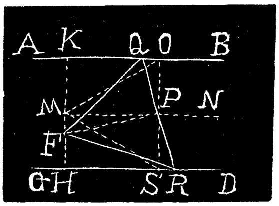
No solution of this problem has been received.

156. Proposed by F. M. McGAW, A. M., Professor or Mathematics, Bordentown Military Institute, Bordentown, N. J.

To construct an equilateral triangle such that its vertices shall be in each of two parallel lines and a point fixed between these lines.

Solution by G. I. HOPKINS, A. M., Professor of Mathematics and Physics, High School, Manchester, N. H.

Let AB and CD be the two parallel lines, and F the fixed point between them. Through F draw HK perpendicular to CD. Make $\angle NMO=30°$. Draw MN the perpendicular bisector of HK. Draw OS perpendicular to CD. Join F and P, and through P draw QR perpendicular to FP. Join QF and RF, then FQR is the required triangle.



PROOF. Triangles QOP and MFP are right triangles. $\angle QPO=\angle MPF$, being complements of the same $\angle QPM$.

$\therefore$ these triangles are similar. $\therefore$ $OP:MP::QP:FP$, or by alternation $OP:QP::MP:FP$. But these are homologous sides of the triangles OPM and QPF also.

$\therefore$ these triangles are similar, since they are right triangles and the legs proportional. But the $\angle OMP$ is 30° and $\angle MOP$ is 60°.

$\therefore$ $\angle QFP$ is 30° and $\angle FQP$ is 60°. Triangle FPR is easily shown to be equal to triangle FPQ.

$\therefore$ $\angle FRP=60°$. $\therefore$ triangle FQR is equiangular and therefore equilateral.

Excellent solutions were received from G. M. M. Zerr, H. C. Whitaker, J. Scheffer, and Theodore Linquist. Professors Zerr's and Whitaker's solutions were by analytical geometry; Professor Scheffer's solution was by trigonometry and the application of algebra to geometry; and Professor Linquist, of the Kansas Agricultural College, gave a very good construction by pure geometry.

157. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, Ohio.

Find the locus of the center of a circle touching a given line and always passing through a given point.